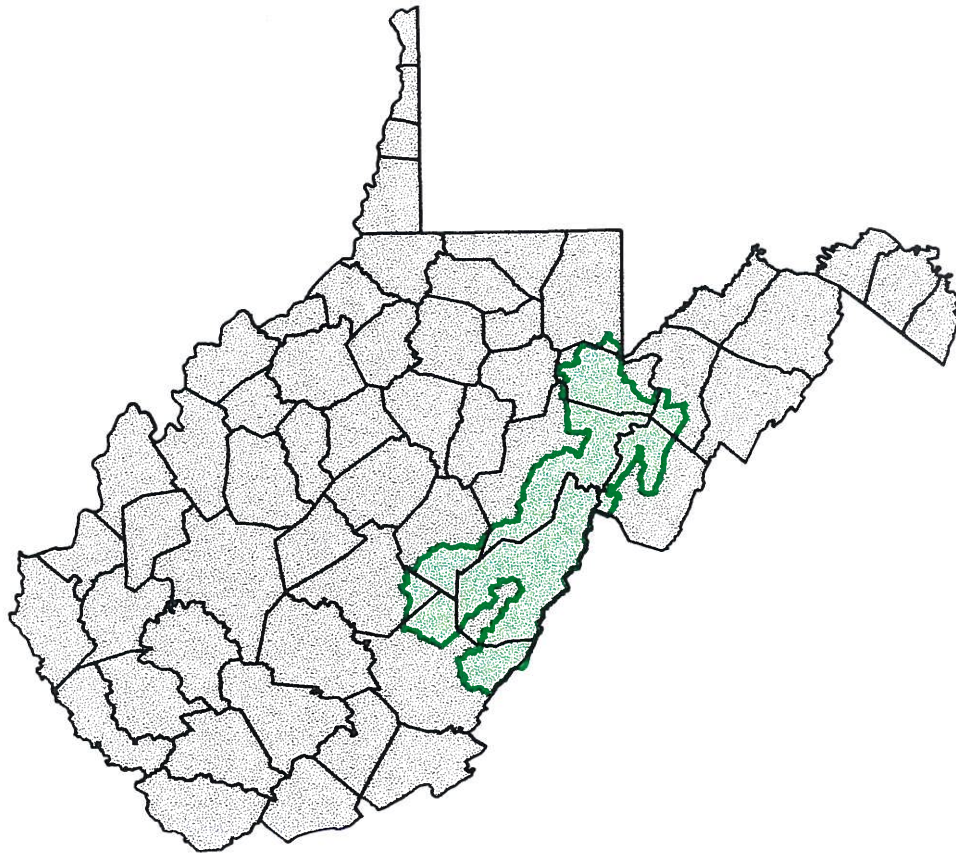


Monongahela National Forest Atlas of Gypsy Moth Treatments and Defoliation, 1990-1995



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Morgantown, WV
January 1997



INTRODUCTION

Why a Gypsy Moth Atlas for the Monongahela National Forest?

The gypsy moth, Lymantria dispar, defoliated susceptible oak forests in West Virginia within the proclamation boundary of the Monongahela National Forest for the first time in 1990. That same year, the first aerial treatments with insecticide and/or pheromones were made to reduce the threat of repeated defoliations and the increased risk of tree mortality. Both treatments and defoliation continued for each of the next 5 years as the gypsy moth infestation spread over the northern half of the Forest. After the 1995 treatments and defoliation in unsprayed forests, the gypsy moth infestation collapsed throughout the northern portion of the Monongahela National Forest. The collapse was attributed to the rapid and widespread development of natural disease epizootics caused by the gypsy moth fungus, Entomophaga maimaiga, and the gypsy moth nucleopolyhedrosis virus.

This atlas documents where gypsy moth infestations occurred and where treatments were made each year from 1990 to 1995. Federally-owned lands of the Monongahela National Forest are emphasized. A general perspective of these gypsy moth infestations is provided by displaying defoliation on federal ownership within the proclamation boundary of the Monongahela National Forest (see maps on pages 5-8). The data used to produce the maps and summaries that appear in this atlas reside on the Forest Health Protection (FHP) Geographic Information System (GIS) at the US Forest Service office in Morgantown, WV. Similar data for non-federal lands within the MNF are stored on the FHP GIS, but are not included in the maps in this atlas.

The atlas is intended as a reference for Monongahela National Forest personnel interested in understanding the location, amount and reoccurrence of past gypsy moth infestations on their Forest. Persons involved in forest pest management activities, such as spray project planning, should find the atlas useful as background when preparing environmental assessments of future spraying.

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PROCEDURES

How was this Gypsy Moth Atlas Made?

Summaries and maps in this atlas were generated using ARC/INFO and ArcView Geographic Information System (GIS) software. Because the collection of data spanned six years, several government agencies, programs, and associated personnel were involved in the data collection and input into the GIS. Two slightly different 1:24,000 scale topographic map (quad) series were used as the base for delineation of gypsy moth treatments and defoliation. One map series used was produced by the United States Geological Survey (USGS) and the other was produced by the United States Forest Service (USFS) and is known as the Primary Base Series (PBS) map. The main difference between the two map series is that the green tint on the USGS maps indicates wooded/forested areas while the green tint on the USFS PBS maps indicates federal ownership of National Forest lands.

Ownership. The Monongahela National Forest (MNF) proclamation boundary data layer was digitized by Forest Health Protection Staff in Morgantown, WV, using the Forest Service PBS maps as the base. The Forest ownership layer depicting federal and non-federal lands was also digitized from Forest Service Primary Base Series maps and was obtained from the Entomology Staff at Virginia Polytechnic Institute (VPI), Blacksburg, VA. The VPI Staff obtained the ownership layer from the US Forest Service's Geometronics Service Center, Salt Lake City, UT, as part of the digital Cartographic Feature Files (CFFs). The CFFs contain many layers of data on the Forest - ownership is just one of the layers. At VPI, the CFFs were converted into ARC/INFO coverages and were edited. The ownership layer contained in the Cartographic Feature Files was used in this atlas to determine the status of ownership (federal/non-federal) on the Forest. Other data layers (treatments and defoliations) were combined with the CFF ownership layer and subsequently coded for ownership based on the CFF designation. The Monongahela National Forest Map Index on page 4 shows these federally-owned lands within the proclamation boundary. Note that the Cartographic Feature Files may not contain the most recent Forest acquisitions; most notably for this atlas, the Dolly Sods North purchase unit.

Defoliation. Although gypsy moth defoliation has occurred in West Virginia since 1986, no gypsy moth defoliation occurred within the Monongahela National Forest prior to 1990. Defoliation was observed aurally by West Virginia Department of Agriculture (WVDA) staff who sketchmapped polygons representing defoliation onto 1:24,000 scale USGS topographic maps. For the years

before 1993, the defoliation data was digitized by US Forest Service and West Virginia University Department of Geology and Geography Staff, Morgantown, West Virginia, under the Appalachian Integrated Pest Management (AIPM) Gypsy Moth Demonstration Project. After 1993, defoliation data was digitized by WVDA staff and provided to the Forest Service upon request. Only defoliation reported in timber and recreation areas and in spray blocks of the Monongahela National Forest have been verified through on-the-ground observation by Monongahela National Forest or Forest Health Protection staff.

Treatments. Gypsy moth spray blocks were delineated on USGS topographic maps or Forest Service PBS maps (both at 1:24,000 scale). Treatments by WVDA on private lands within the proclamation boundary of the Monongahela National Forest are not depicted in this atlas. For 1992 and earlier, treatment blocks were delineated by WVDA staff and the resulting polygons were digitized under the auspices of AIPM for all ownerships within the proclamation boundary of the Forest. However, since 1993, treatment blocks have been delineated on Forest Service PBS edition maps, and digitized by Forest Health Protection for only Monongahela National Forest lands. In areas where federal and non-federal lands are adjacent, some data discrepancies may occur due to the use of the two different base maps. The digitized ownership layer from the Cartographic Feature Files became available only after data analyses for the atlas were started. This likely accounts for the reporting of acres on federal ownership treated with the chemical insecticide Dimilin in 1993 when only WVDA sprayed this insecticide on private lands within the proclamation boundary. Also, it would explain the small defoliated area reported in 1995 when the Monongahela National Forest treated with the biological insecticide Bacillus thuringiensis (Bt).

What More should You Know about the Data?

The subjective nature of rendering defoliation from aerial sketchmapping, and the contrasting methods of calculating acreage between mechanical (planimeter) and electronic computer process (GIS), are factors which have affected the calculation of acres treated and defoliated. It was found that slight (<5%) differences exist in the acreage reported in the charts of defoliation and treatment acreage compared to those reported in the "History of Gypsy Moth Defoliation on the Monongahela National Forest, 1993-1995" by US Forest Service, Northeastern Area, Forest Health Protection (FHP), Morgantown, West Virginia.

RESULTS

Where was the Gypsy Moth Defoliation on the Monongahela National Forest, When did Defoliation Occur, and How Long did Defoliation Last?

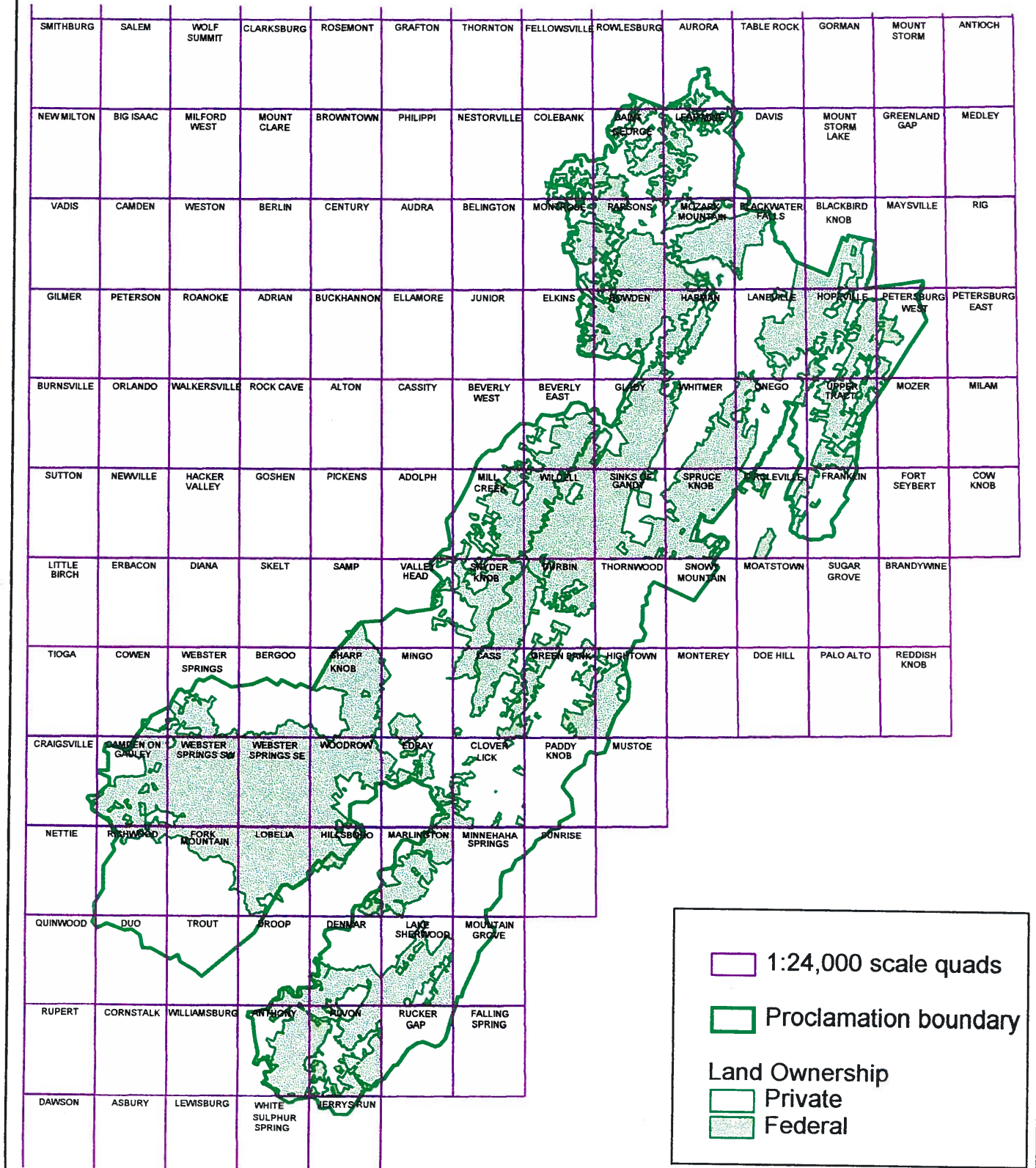
Pages 5 to 11 present gypsy moth defoliation maps, summaries, and charts for the years from 1990 through 1995. The maps depict the location of the defoliation on federally-owned lands within the proclamation boundary of the Monongahela National Forest. Data in the tables and charts show the amount (acres) of defoliation and its reoccurrence (years on the same acre) and can be compared between non-federal and federally-owned forests within the Monongahela National Forest.

Which Areas of the Monongahela National Forest were Treated each Year and How much Defoliation Occurred in the Treated Areas?

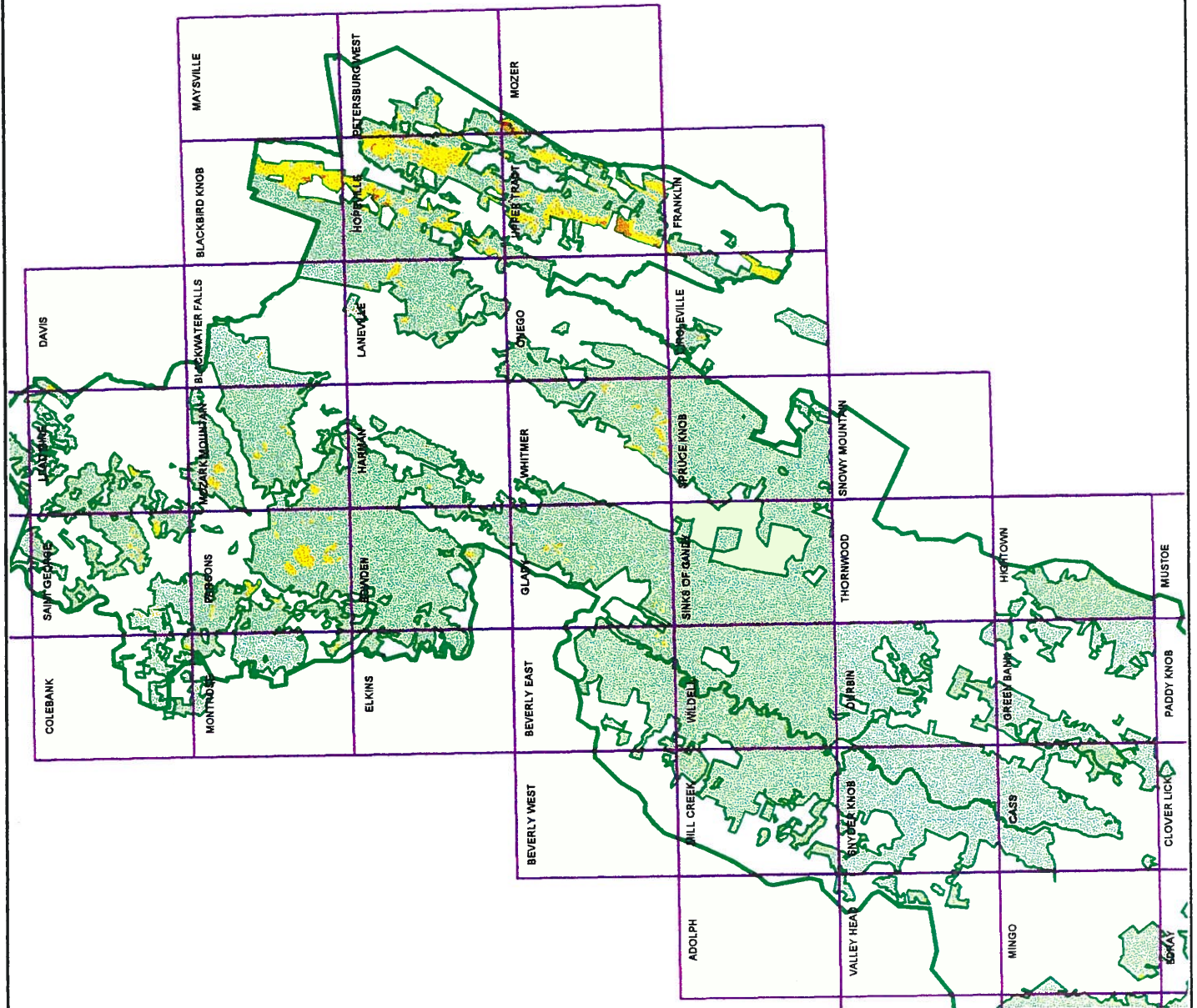
Pages 12 to 25 present gypsy moth defoliation maps, summaries, and charts for each year from 1990 through 1995. The maps and data indicate the extent (percent) to which the defoliation occurred within gypsy moth spray project blocks on federal lands of the Monongahela National Forest.

Monongahela National Forest

Map Index

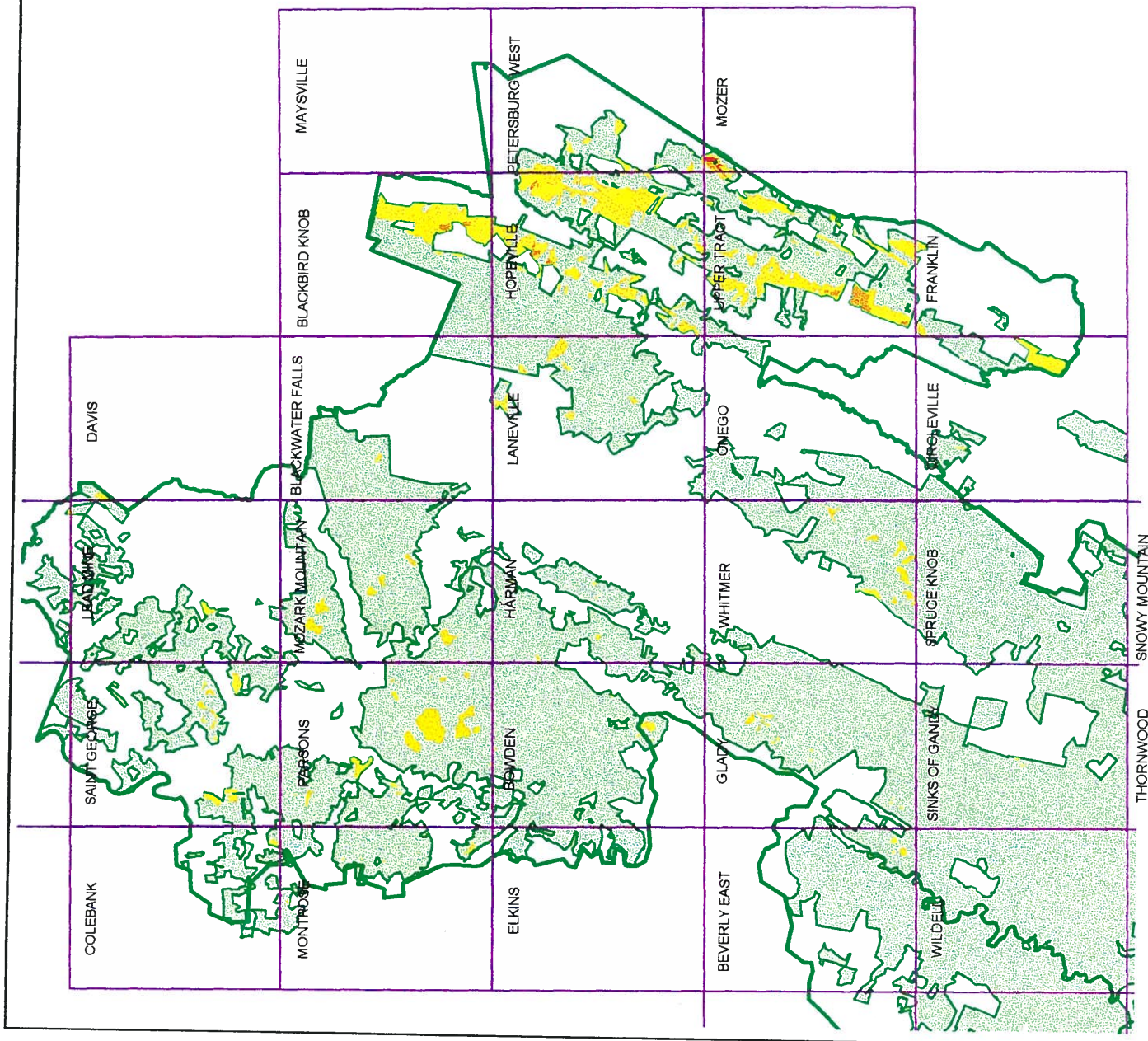
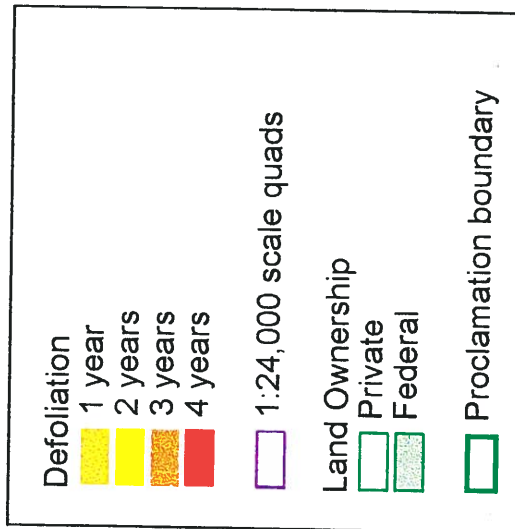


Number of Years of Defoliation on Federally-Owned Lands 1990-1995



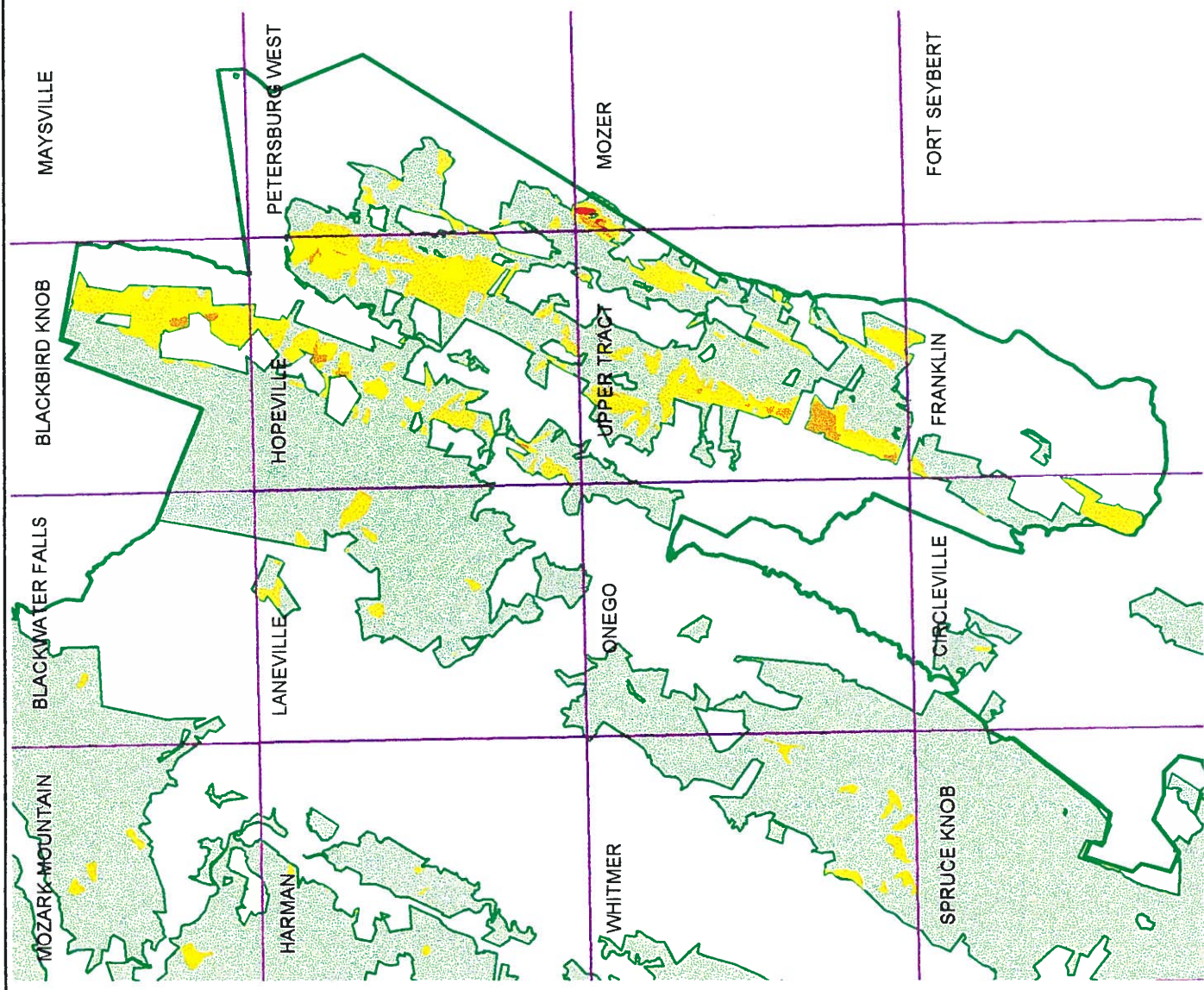
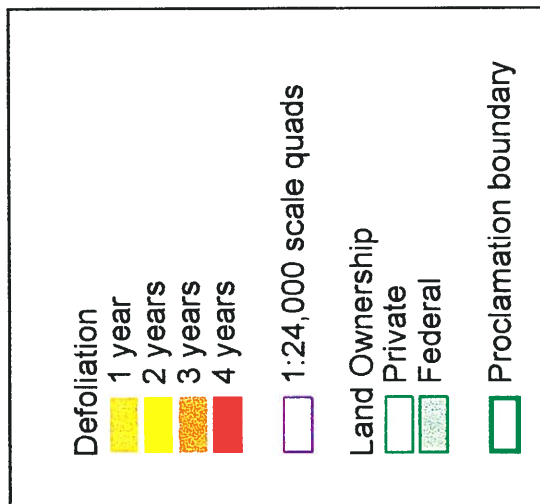
Number of Years of Defoliation on Federally-Owned Lands 1990-1995

Northern Portion



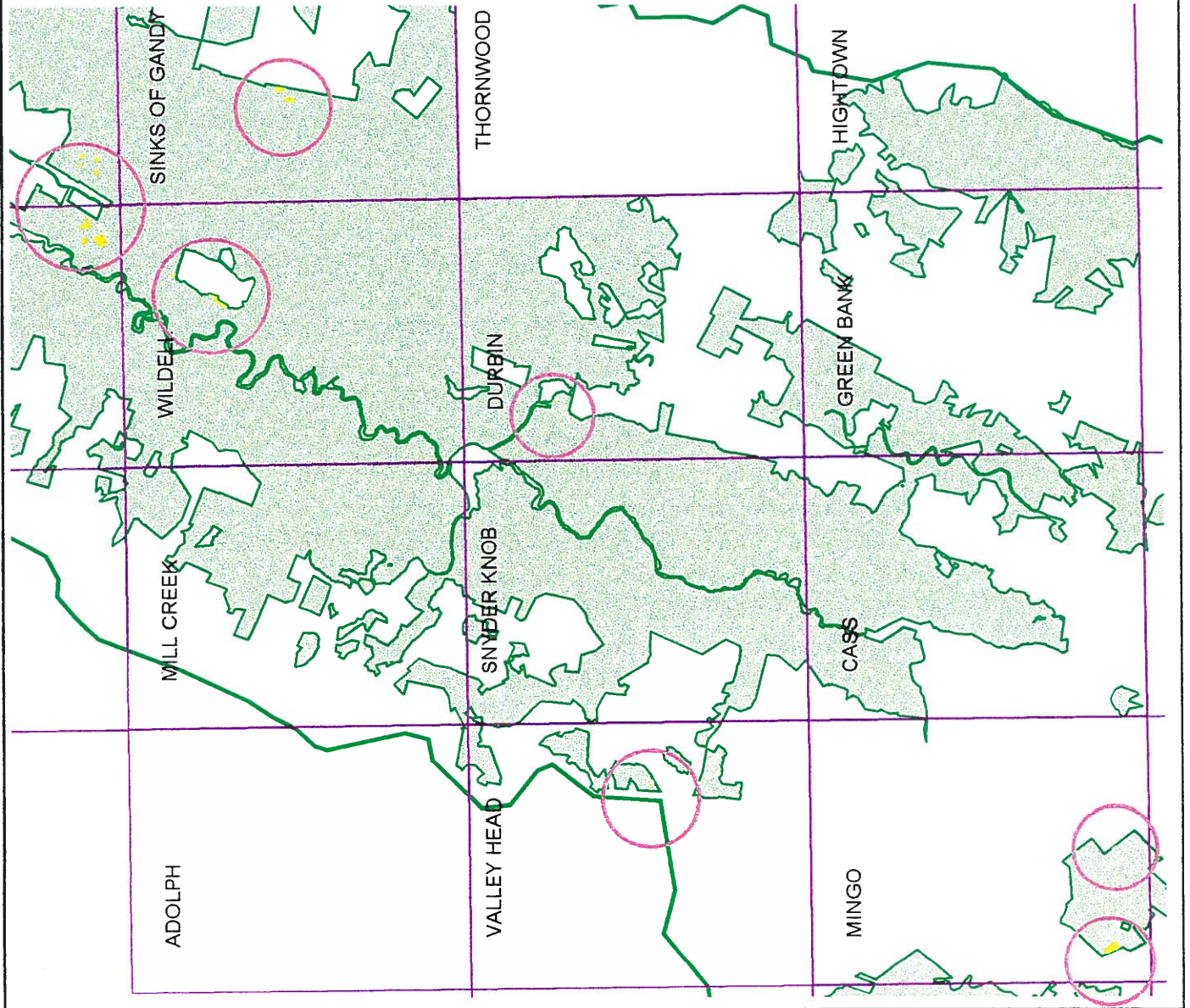
Number of Years of Defoliation on Federally-Owned Lands 1990-1995

Eastern Portion



Number of Years of Defoliation on Federally-Owned Lands 1990-1995

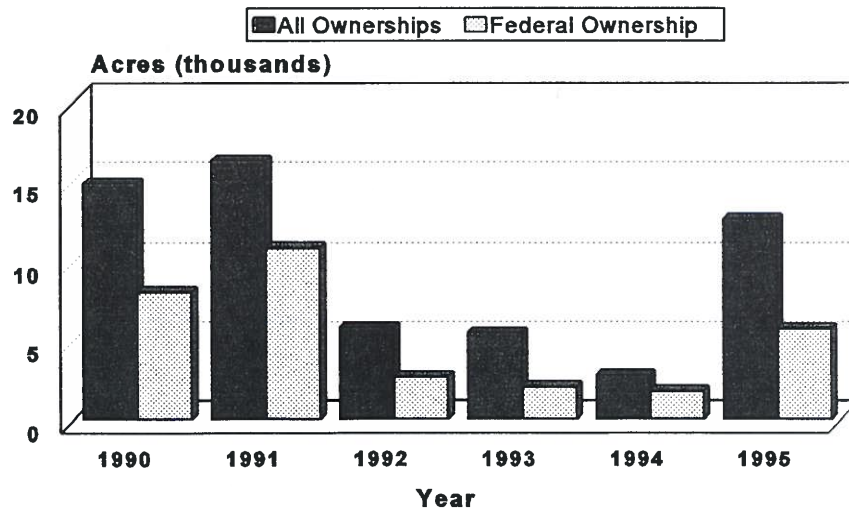
Southern Portion of Defoliation



Amount (acres) of Gypsy Moth Defoliation within the Monongahela National Forest Proclamation Boundary Annually from 1990-1995.

Chronology of Gypsy Moth Defoliation	Defoliation All Ownerships (acres)	Defoliation Federal Ownership (acres)
1990	14,775	8,085
1991	16,249	10,847
1992	5,777	2,642
1993	5,418	2,019
1994	2,734	1,739
1995	12,603	5,699
5-Year Totals	45,470	24,650

**Total Acres Defoliated by Year
1990-1995**

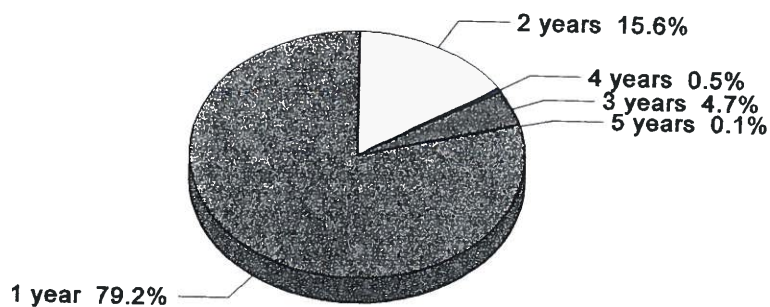


Within the Proclamation Boundary of the Monongahela National Forest.

Reoccurrence (years on same acre) of Gypsy Moth Defoliation on Federal Ownership within Monongahela National Forest Proclamation Boundary, 1990-1995.

Reoccurrence (years)	Defoliation (acres)
1	36,001
2	7,108
3	2,219
4	205
5	26

**Total Acres Defoliated - All Ownerships
(How Many Years was the Same Acre Defoliated?)
1990-1995
(45,470 acres)**

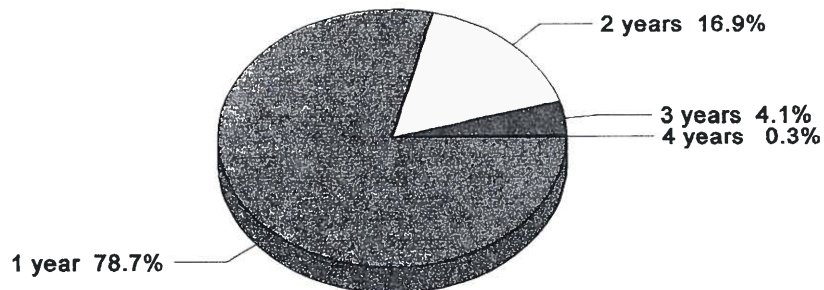


Within the Proclamation Boundary of the Monongahela National Forest.

Reoccurrence (years on same acre) of Gypsy Moth Defoliation on Federal Ownership within Monongahela National Forest Proclamation Boundary, 1990-1995.

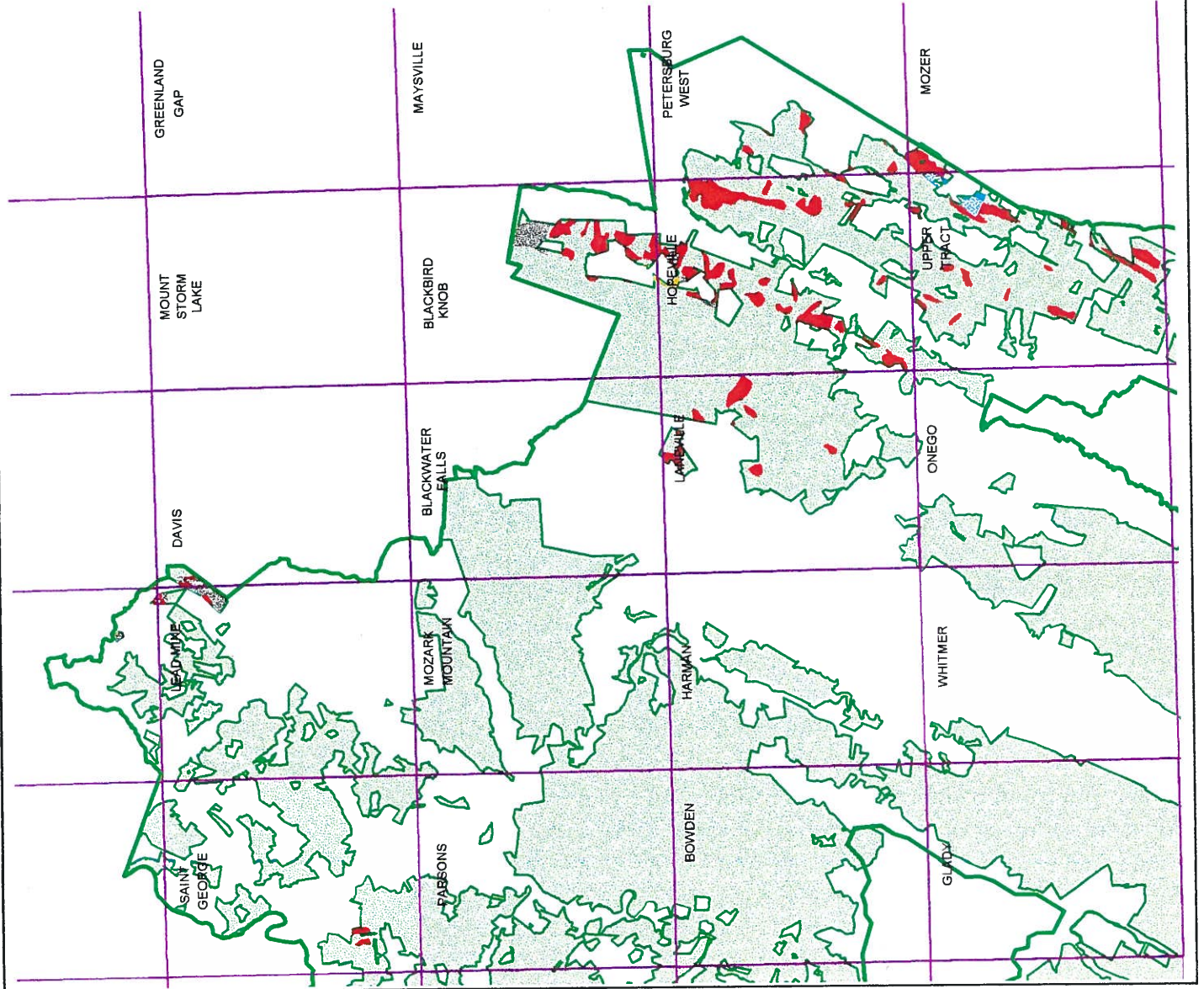
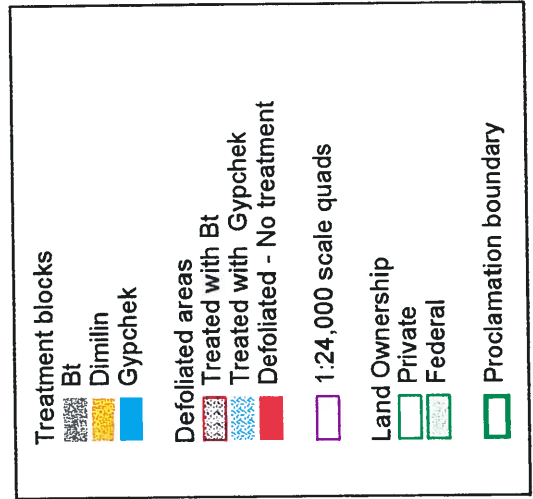
Reoccurrence (years)	Defoliation (acres)
1	19,404
2	4,174
3	1,011
4	62
5	0

**Total Acres Defoliated - Federal Ownership
(How Many Years was the Same Acre Defoliated?)
1990-1995
(24,650 acres)**



Within the Proclamation Boundary of the Monongahela National Forest.

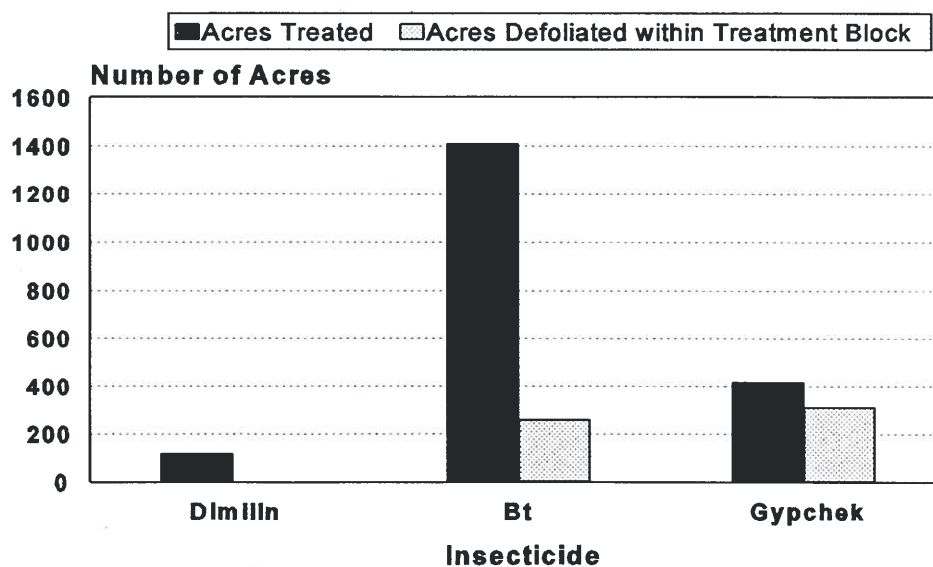
1990 Gypsy Moth Treatment Blocks and Defoliation on Federally-Owned Lands



1990 Gypsy Moth Defoliation (percent) in Treatment Blocks on Federal Ownership within Monongahela National Forest Proclamation Boundary

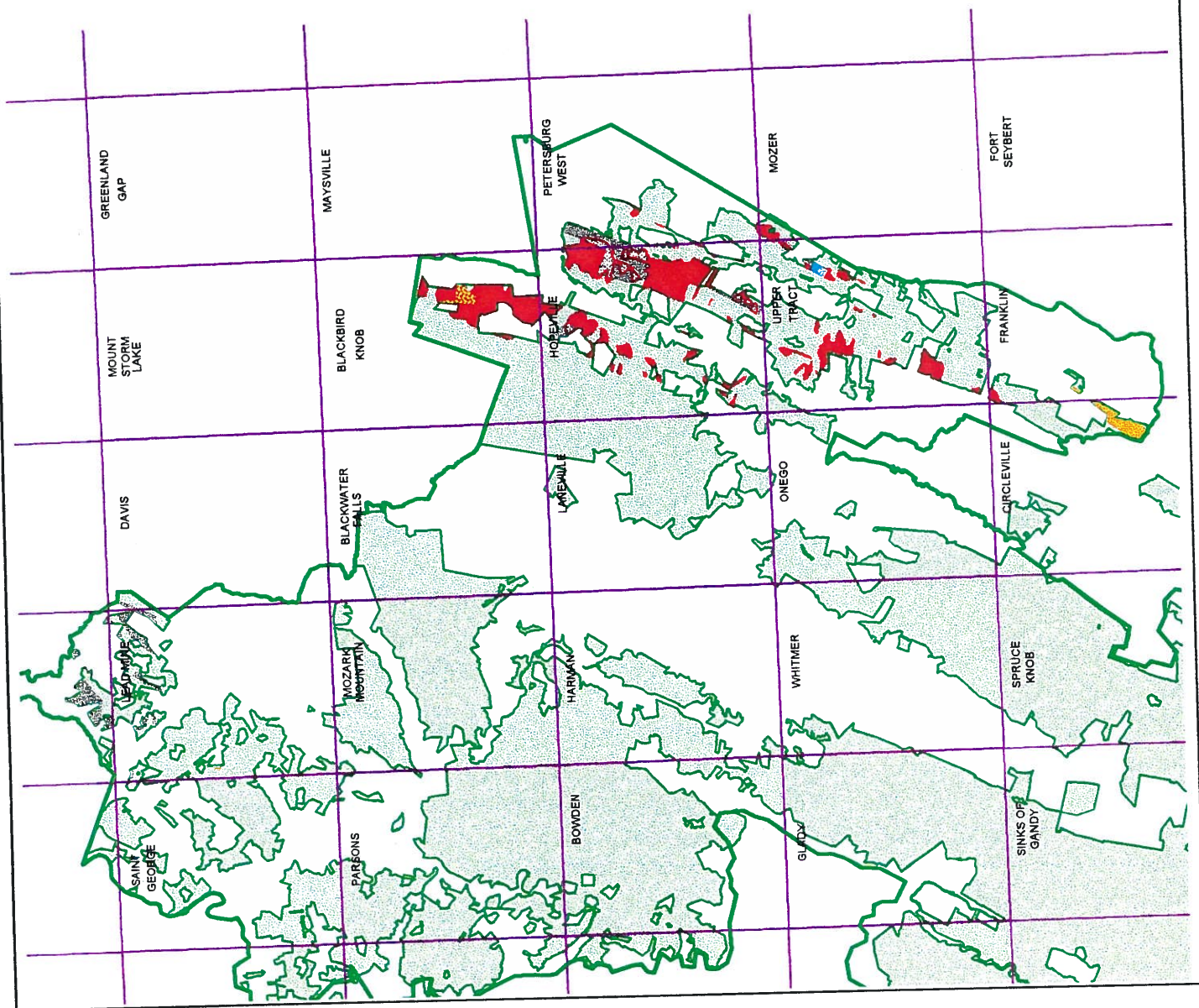
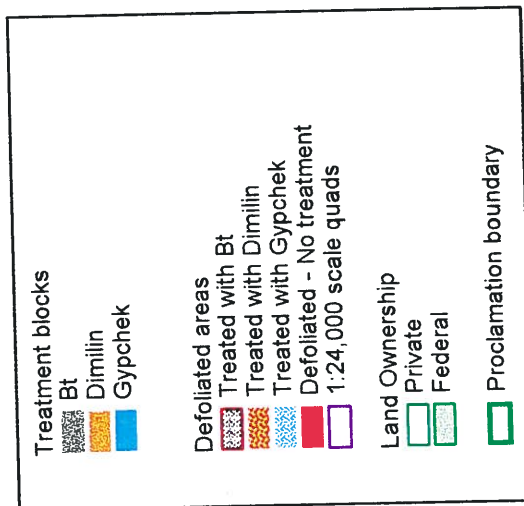
Year	Insecticide Spray Treatment	Total Treated in all Spray Blocks (acres)	Defoliation in all Spray Blocks (acres)	Portion of all Spray Blocks Defoliated (percent)
1990	Dimilin	117	0	0
	Bt	1,409	256	18
	Gypchek	417	309	74
Total		1,943	565	29

**Acres Treated and Defoliated - Federal Ownership
1990**



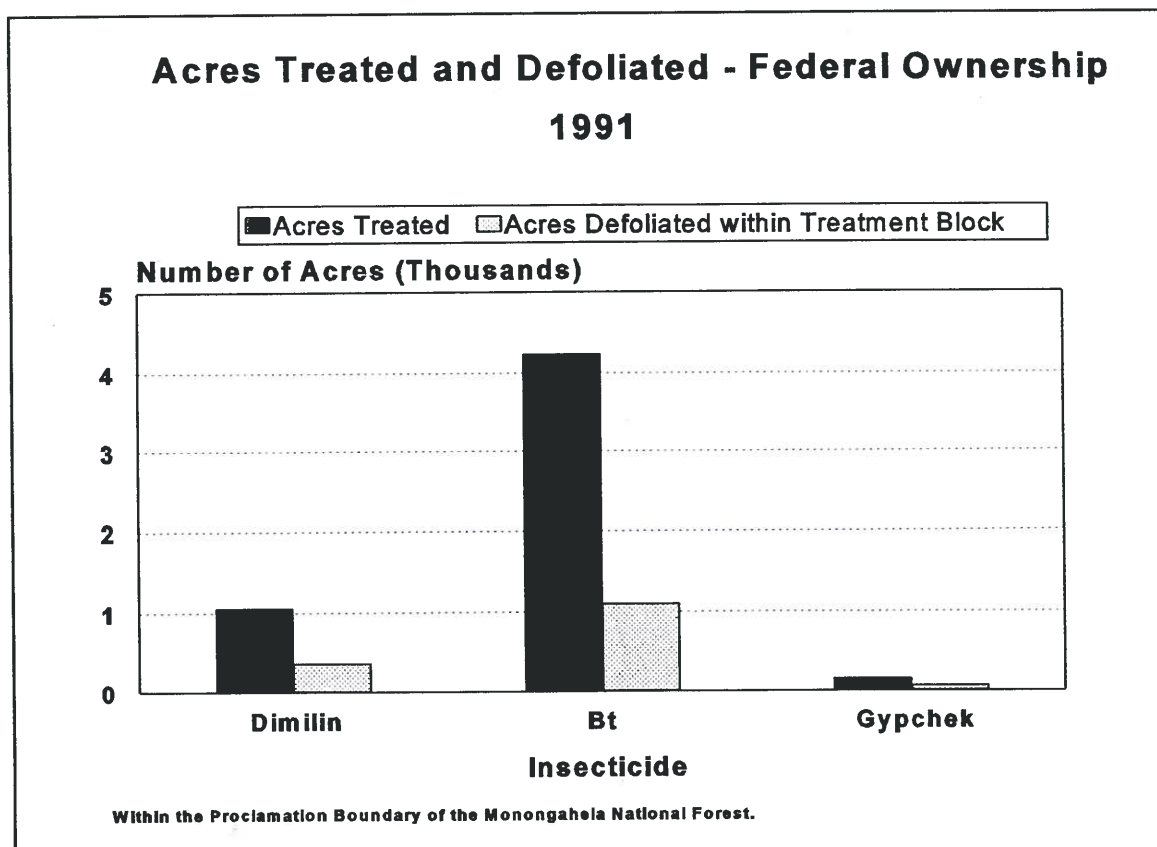
Within the Proclamation Boundary of the Monongahela National Forest.

1991 Gypsy Moth Treatment Blocks and Defoliation on Federally-Owned Lands

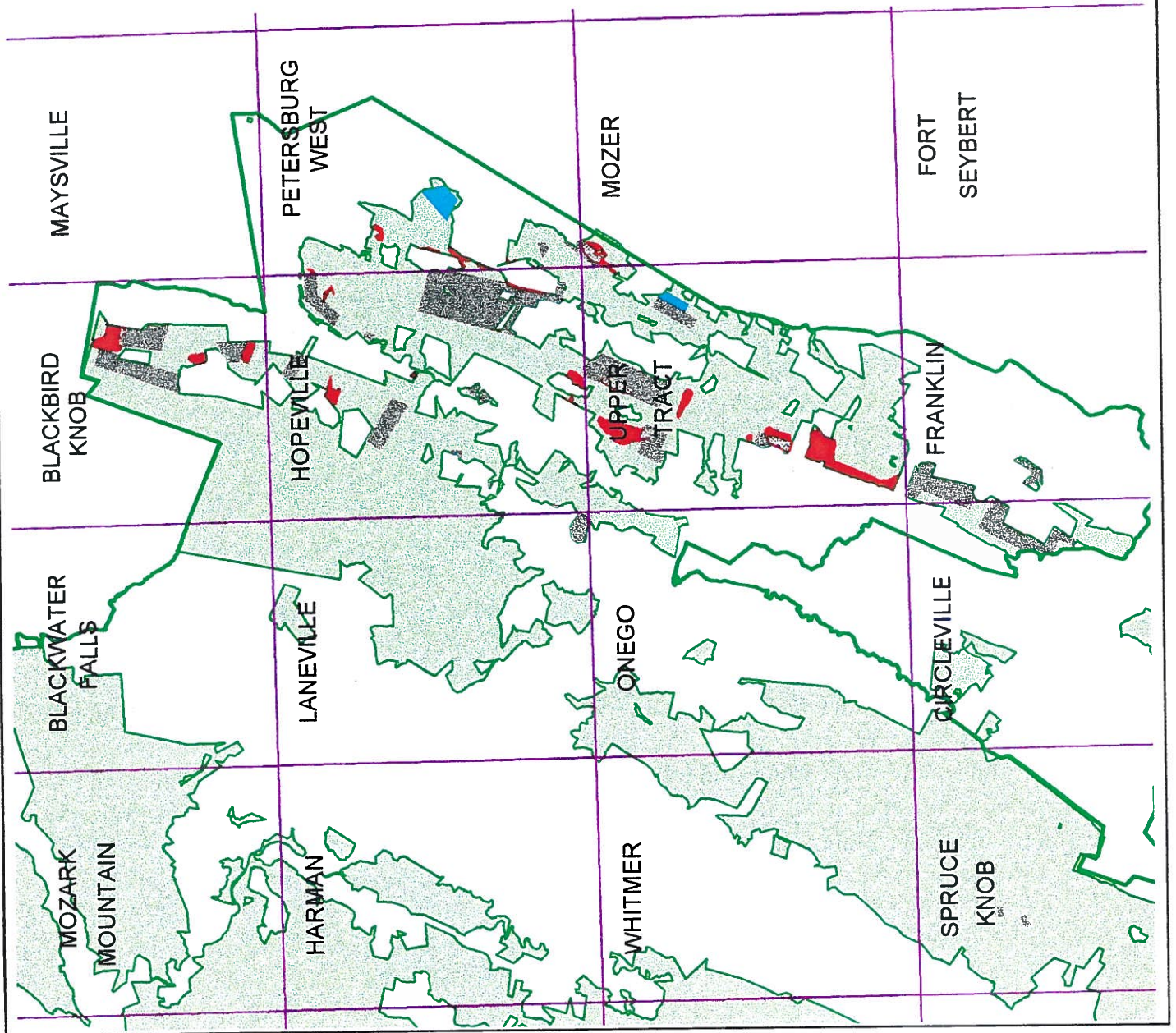
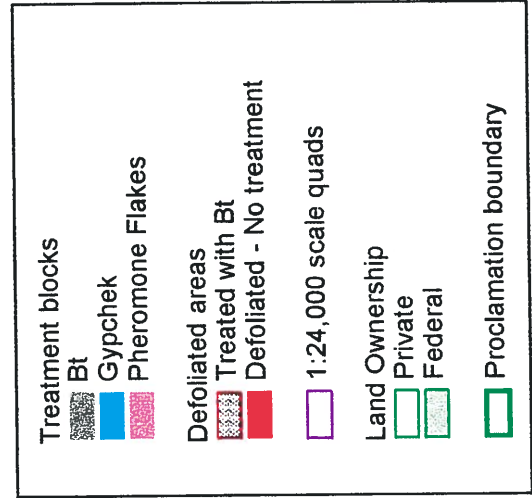
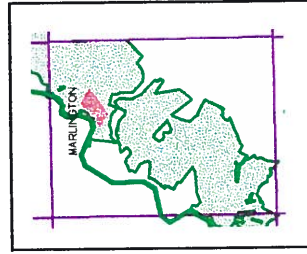


1991 Gypsy Moth Defoliation (percent) in Treatment Blocks on Federal Ownership within Monongahela National Forest Proclamation Boundary

Year	Insecticide Spray Treatment	Total Treated in all Spray Blocks (acres)	Defoliation in all Spray Blocks (acres)	Portion of all Spray Blocks Defoliated (percent)
1991	Dimilin	1,056	350	33
	Bt	4,227	1,096	26
	Gypchek	153	61	40
Total		5,436	1,507	28

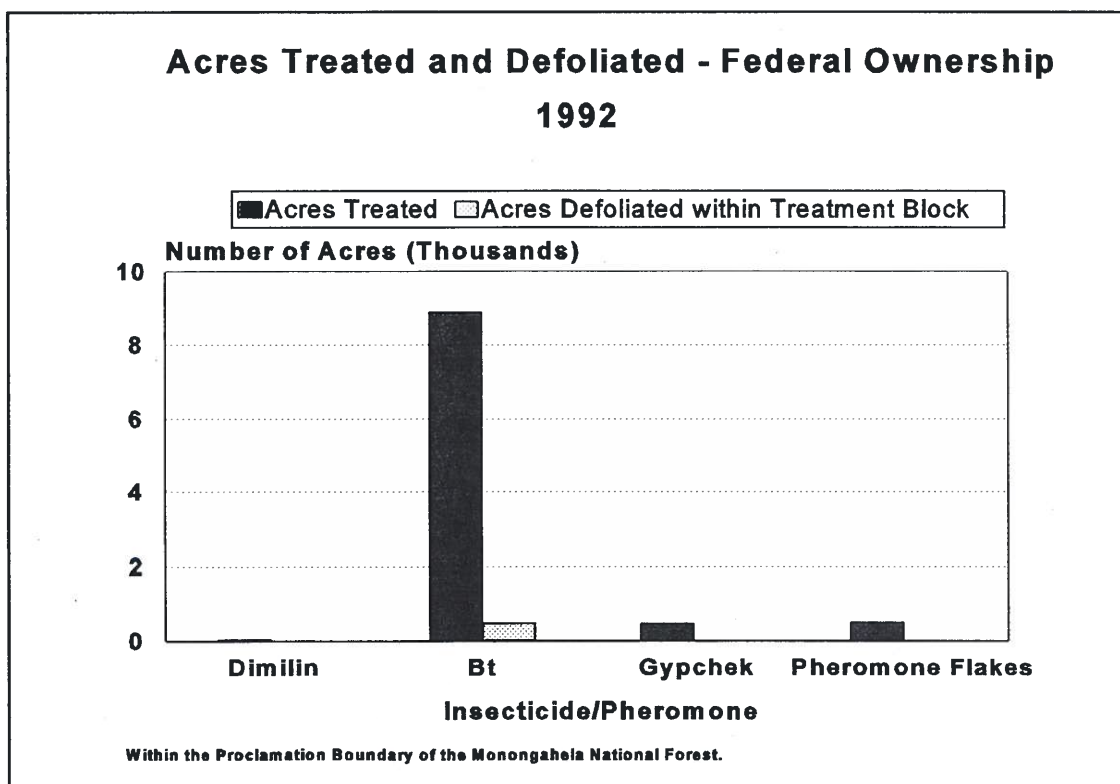


1992 Gypsy Moth Treatment Blocks and Defoliation on Federally-Owned Lands

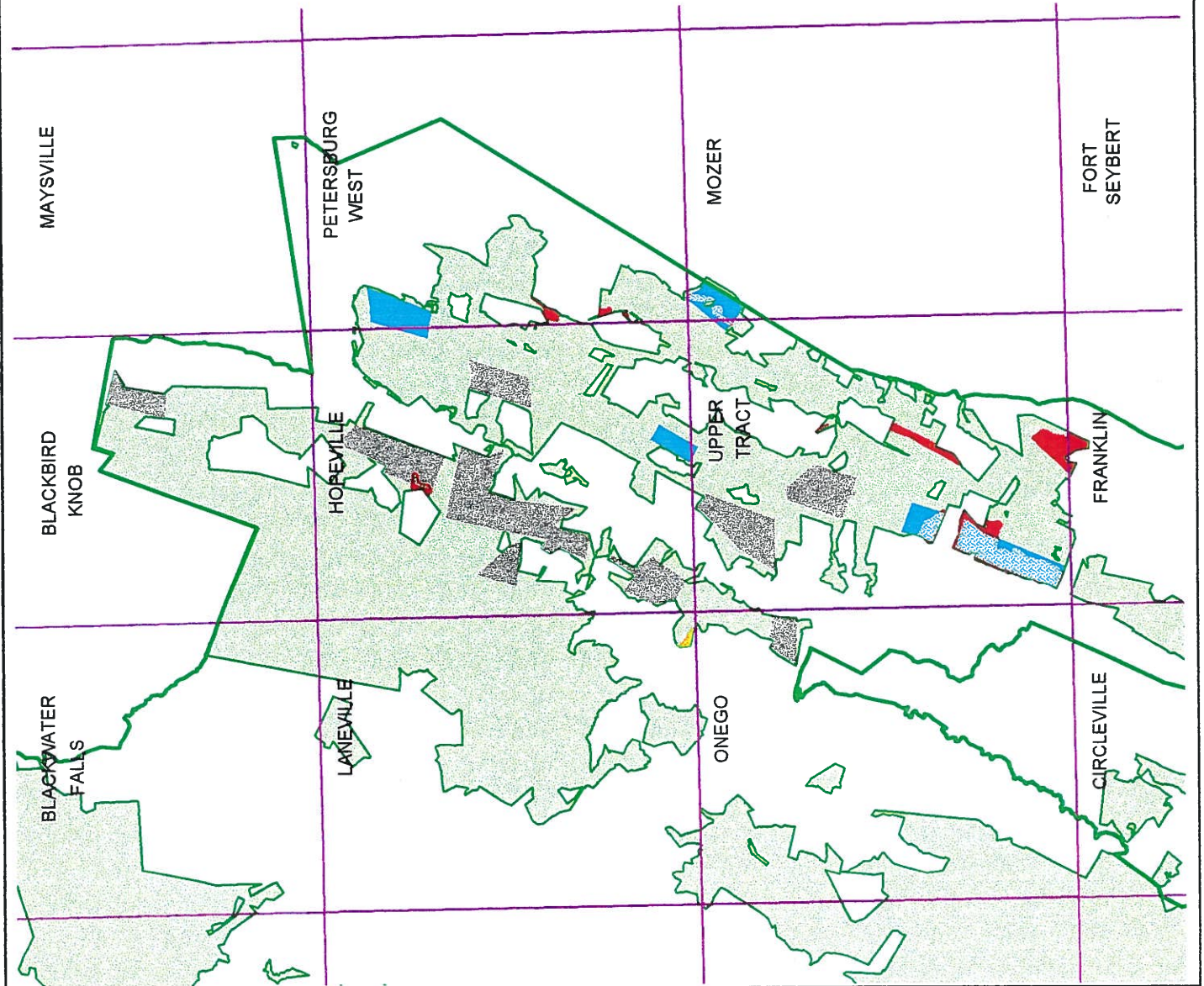
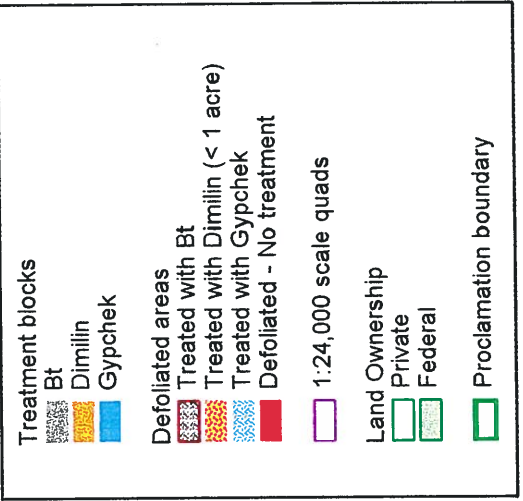


1992 Gypsy Moth Defoliation (percent) in Treatment Blocks on Federal Ownership within Monongahela National Forest Proclamation Boundary

Year	Insecticide/ Pheromone	Total Treated in all Spray Blocks (acres)	Defoliation in all Spray Blocks (acres)	Portion of all Spray Blocks Defoliated (percent)
1992	Dimilin	40	0	0
	Bt	8,882	473	5
	Gypchek	455	0	0
	Pheromone Flakes	492	0	0
Total		9,869	473	5



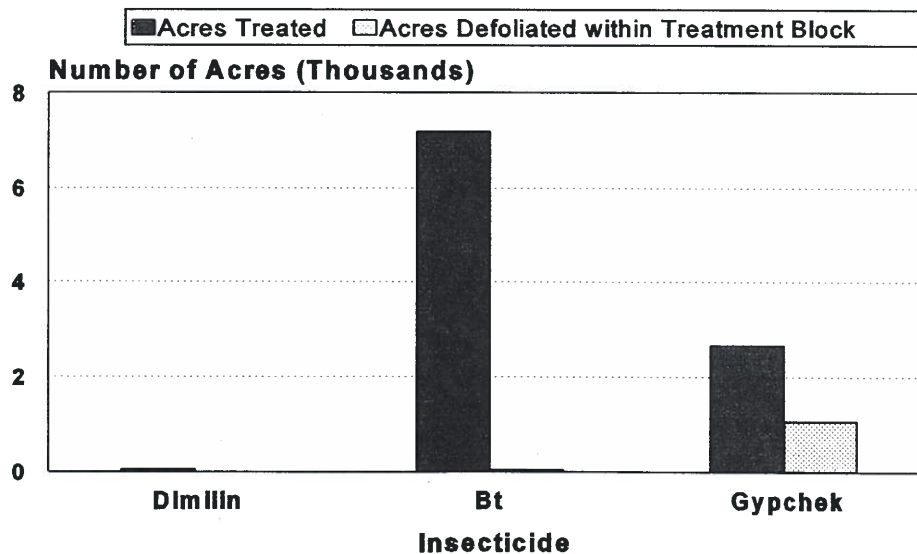
1993 Gypsy Moth Treatment Blocks and Defoliation on Federally-Owned Lands



1993 Gypsy Moth Defoliation (percent) in Treatment Blocks on Federal Ownership within Monongahela National Forest Proclamation Boundary

Year	Insecticide Spray Treatment	Total Treated in all Spray Blocks (acres)	Defoliation in all Spray Blocks (acres)	Portion of all Spray Blocks Defoliated (percent)
1993	Dimilin	47	1	2
	Bt	7,193	37	0.5
	Gypchek	2,651	1,082	41
Total		9,891	1,120	11

**Acres Treated and Defoliated - Federal Ownership
1993**



Within the Proclamation Boundary of the Monongahela National Forest.

1994 Gypsy Moth Treatment Blocks and Defoliation on Federally-Owned Lands

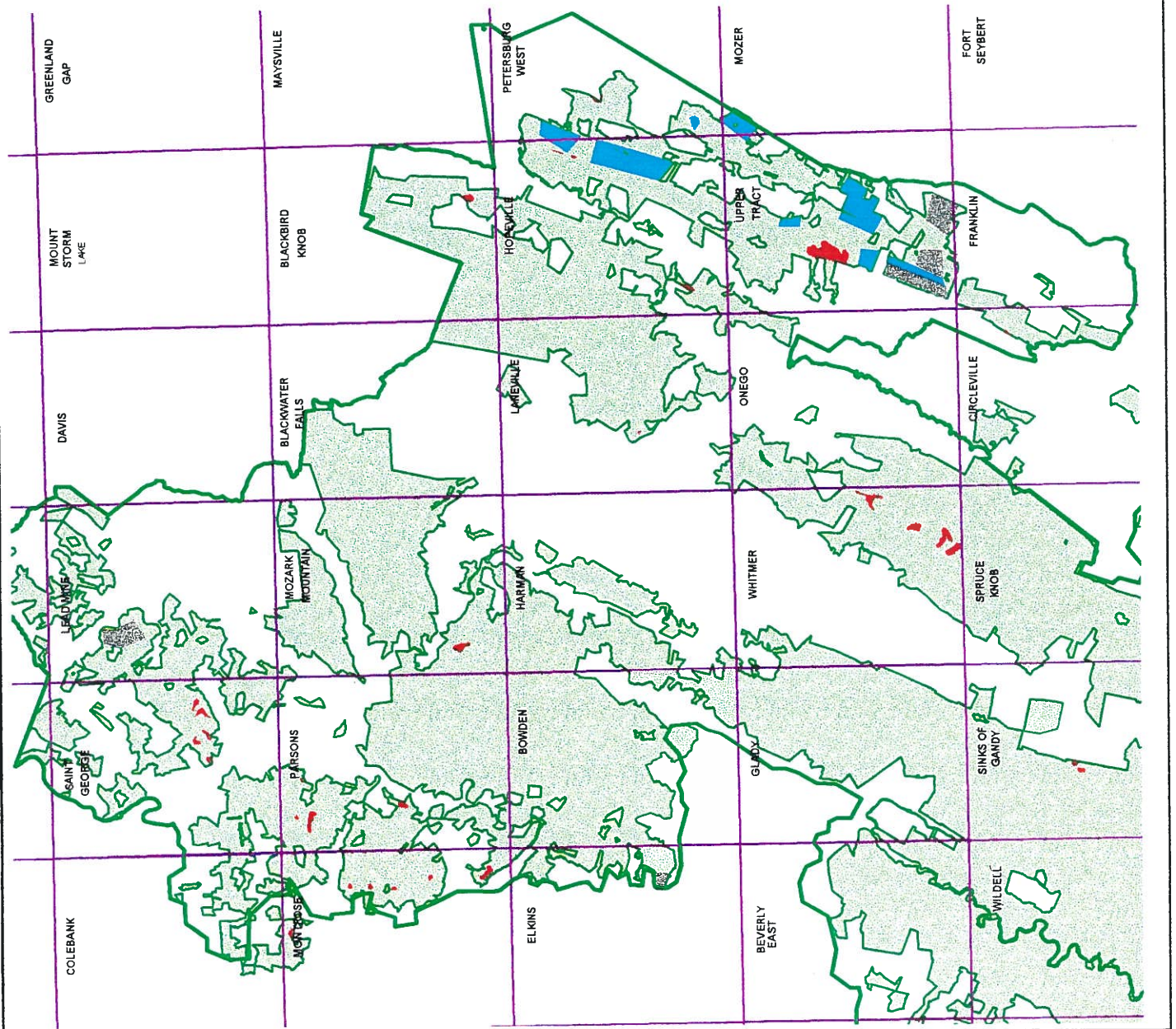
Note: There was no defoliation
in any of the treated areas

Treatment blocks
Bt
Gypchek

Defoliated areas
Defoliated - No treatment
1:24,000 scale quads

Land Ownership
Private
Federal

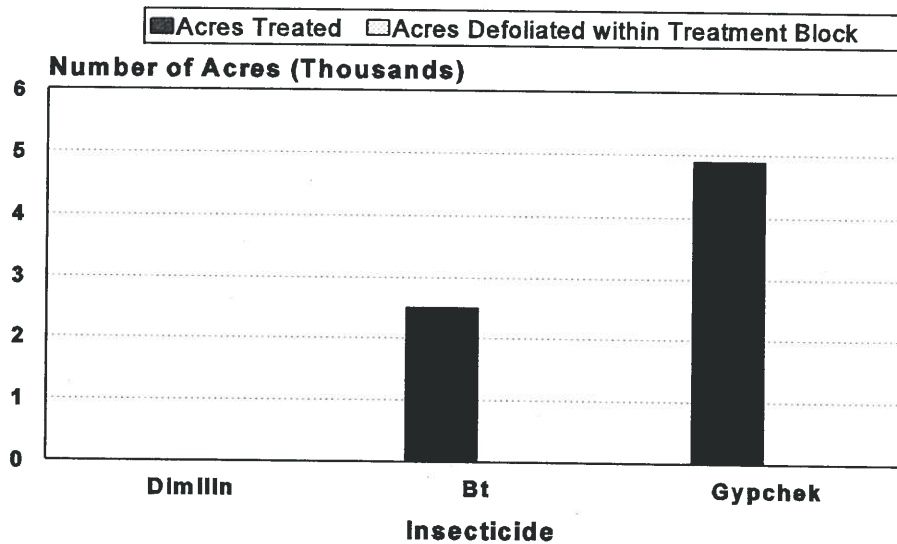
Proclamation boundary



1994 Gypsy Moth Defoliation (percent) in Treatment Blocks on Federal Ownership within Monongahela National Forest Proclamation Boundary

Year	Insecticide Spray Treatment	Total Treated in all Spray Blocks (acres)	Defoliation in all Spray Blocks (acres)	Portion of all Spray Blocks Defoliated (percent)
1994	Dimilin	0	0	0
	Bt	2,715	0	0
	Gypchek	4,889	0	0
Total		7,604	0	0

**Acres Treated and Defoliated - Federal Ownership
1994**



Within the Proclamation Boundary of the Monongahela National Forest.

1995 Gypsy Moth Treatment Blocks and Defoliation on Federally-Owned Lands

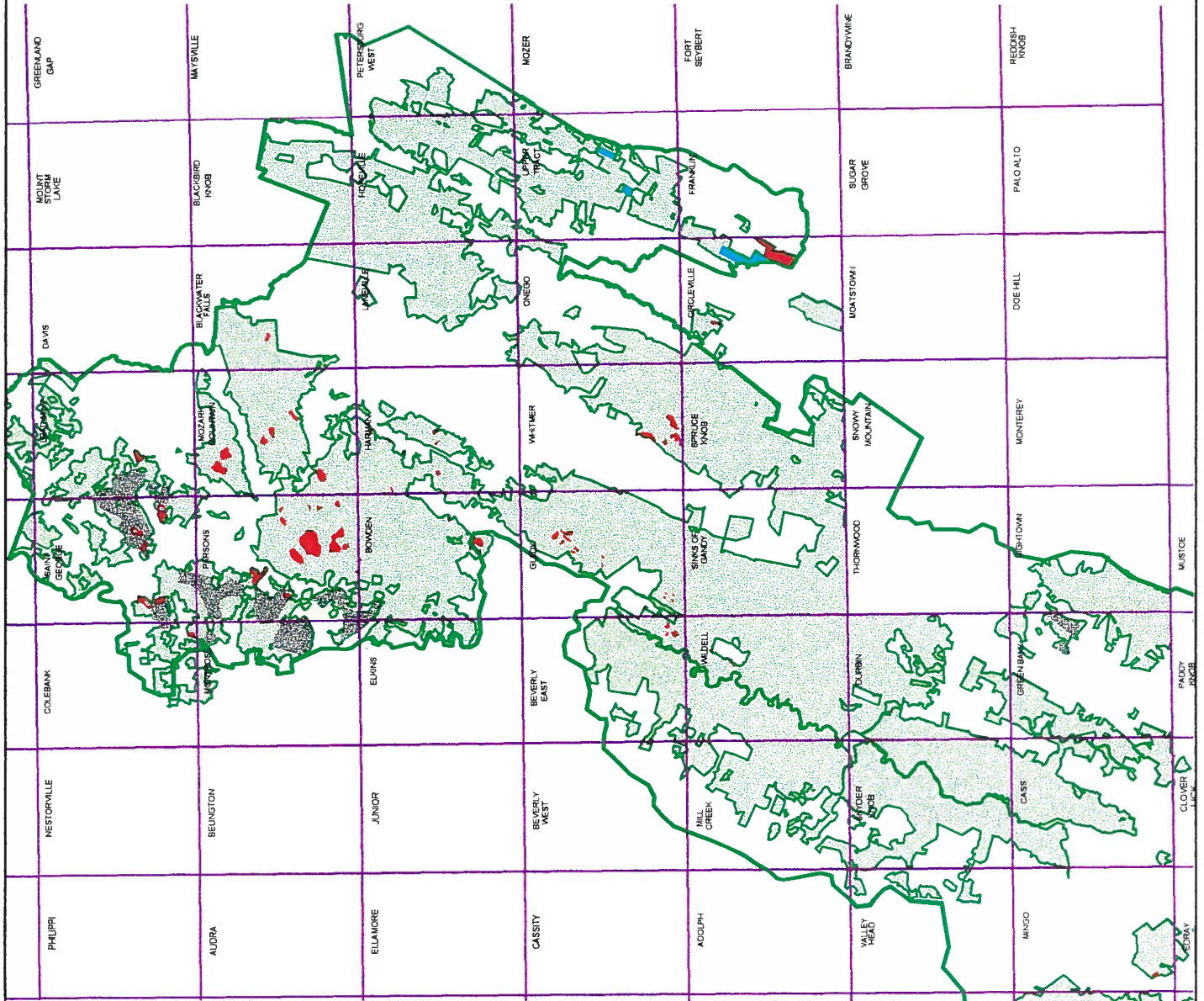
Treatment blocks
 Bt
 Gypchek

Defoliated areas
 Treated with Bt
 Defoliated - No treatment

1:24,000 scale quads

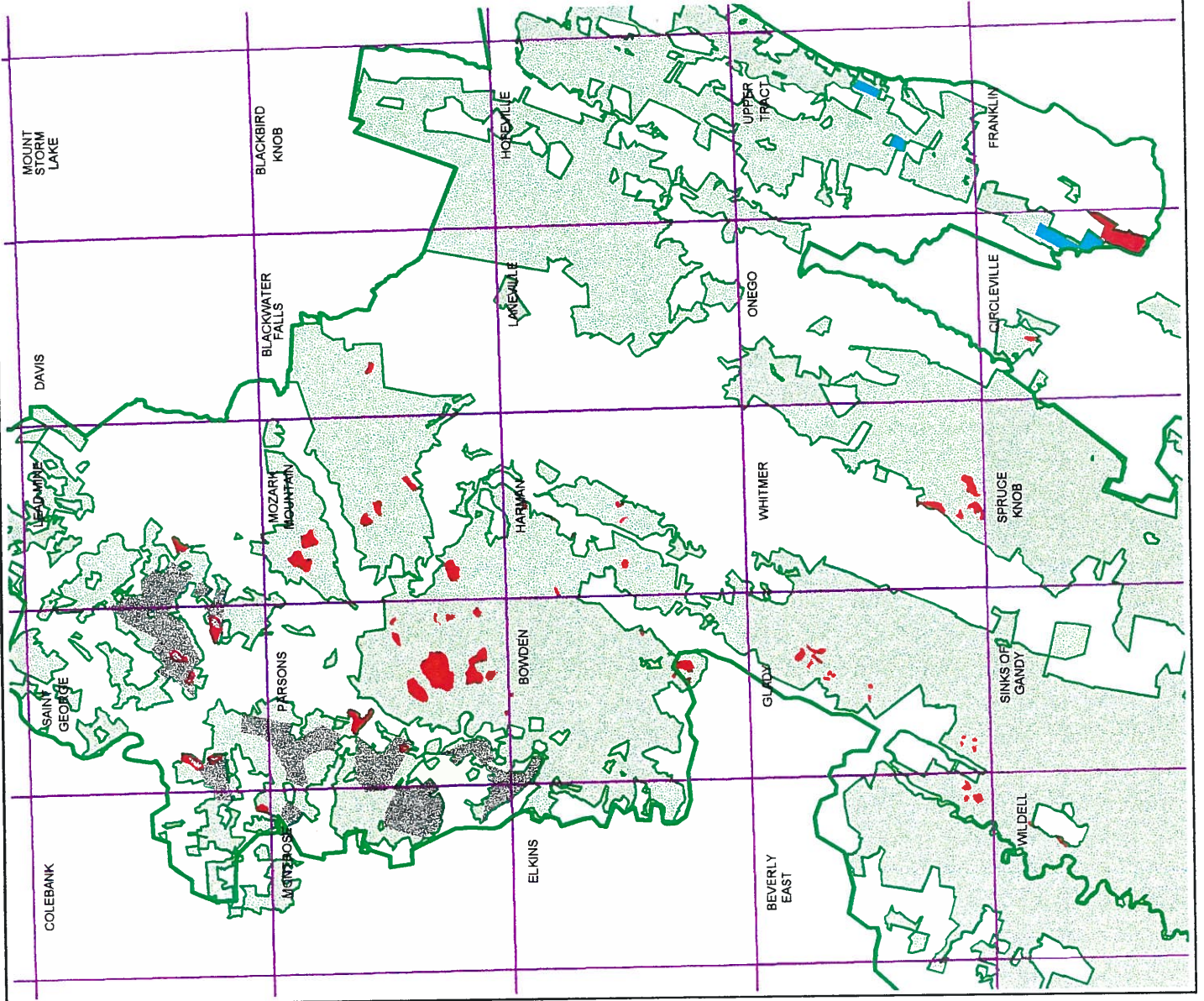
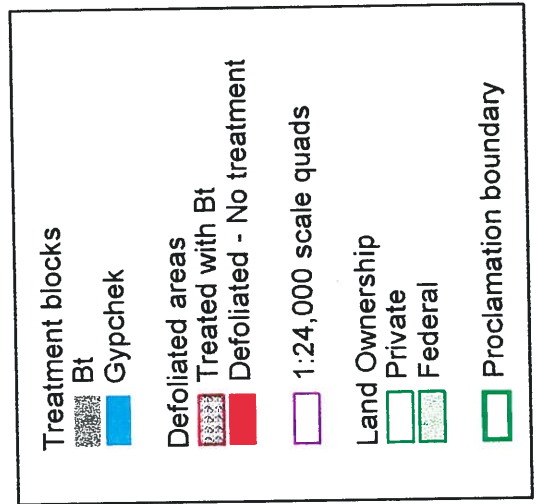
Land Ownership
 Private
 Federal

Proclamation boundary



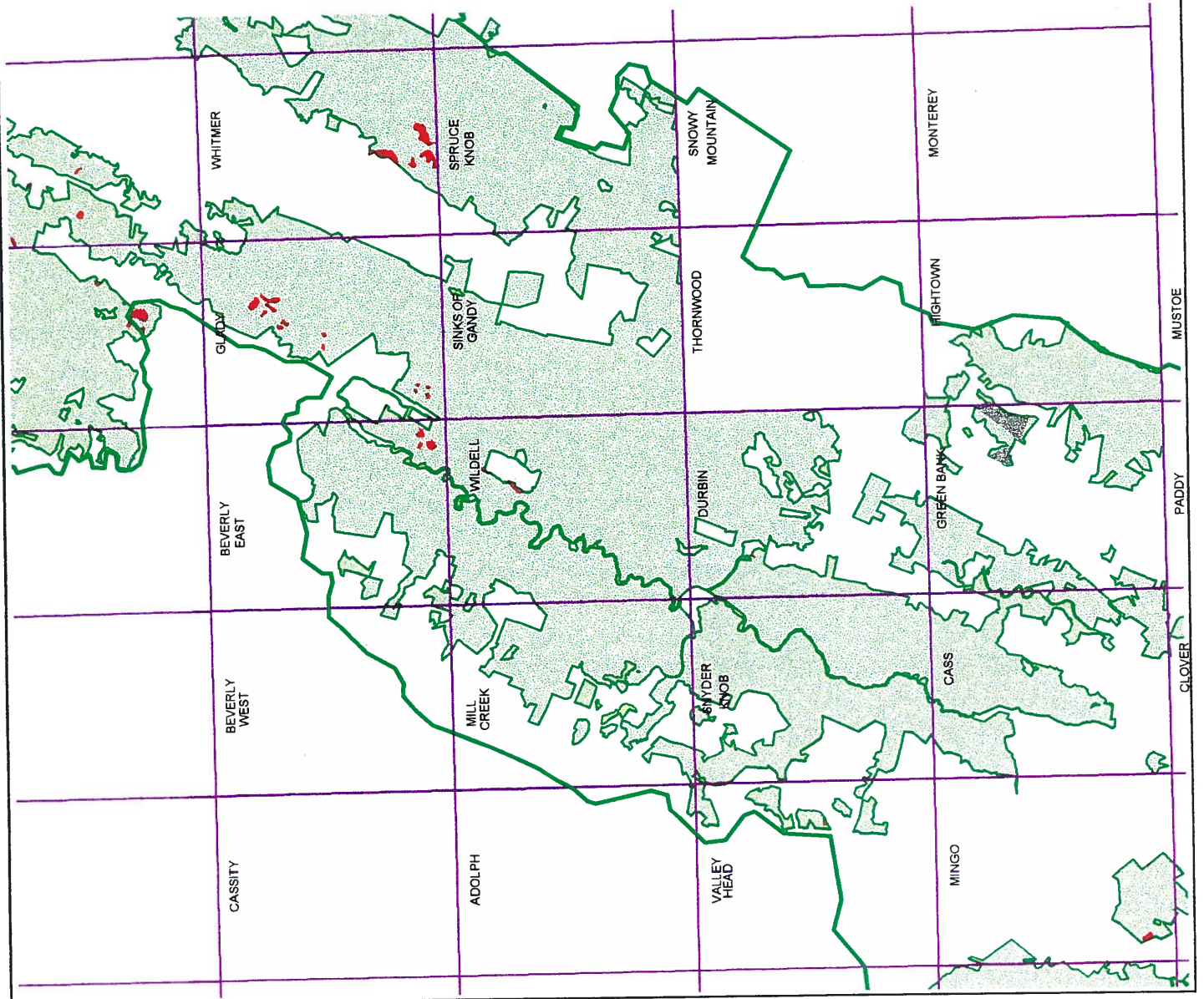
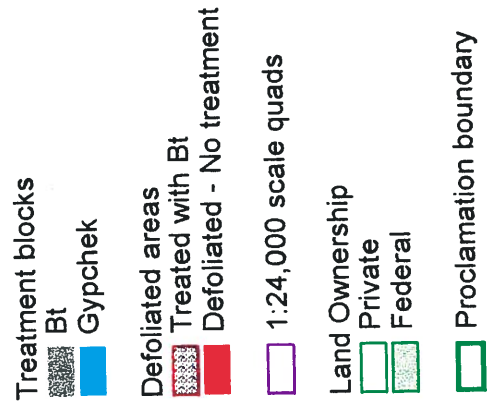
1995 Gypsy Moth Treatment Blocks and Defoliation on Federally-Owned Lands

Northern Portion



1995 Gypsy Moth Treatment Blocks and Defoliation on Federally-Owned Lands

Southern Portion



1995 Gypsy Moth Defoliation (percent) in Treatment Blocks on Federal Ownership within Monongahela National Forest Proclamation Boundary

Year	Insecticide Spray Treatment	Total Treated in all Spray Blocks (acres)	Defoliation in all Spray Blocks (acres)	Portion of all Spray Blocks Defoliated (percent)
1995	Dimilin	0	0	0
	Bt	14,415	349	2
	Gypchek	975	0	0
Total		15,390	349	2

